Shoreline Stabilization Projects

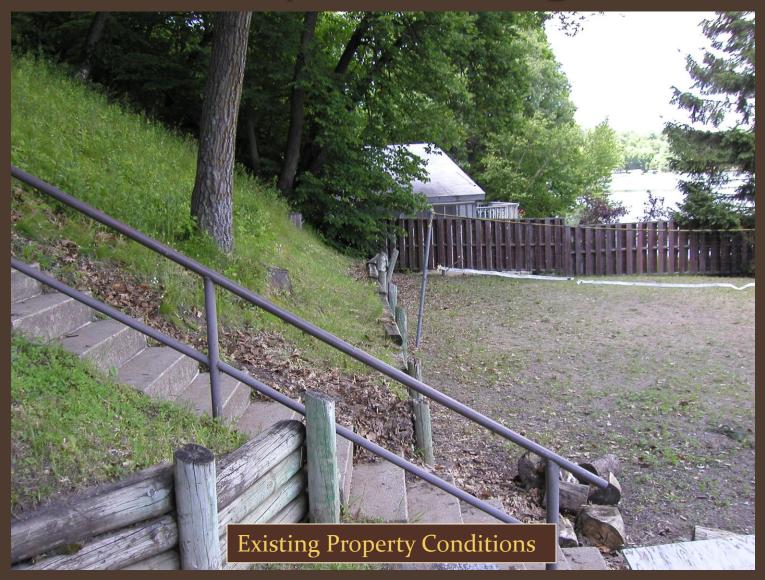


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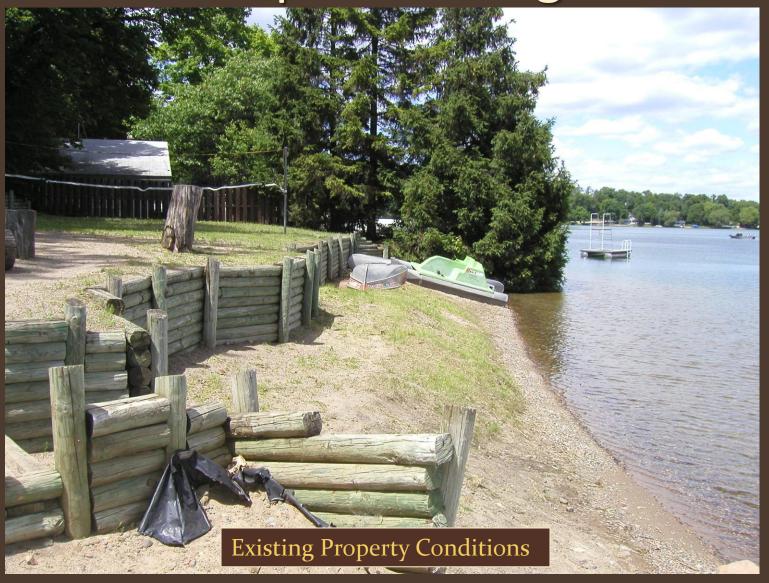
Background & Design Considerations:

- Less than 1/2 mile of fetch to the site
- Natural lake with very little water fluctuation (1.9 feet)
- Small watershed 1,364 acres in which is majority wooded
- Little erosion on the shoreline no toe protection needed
- Failing retaining walls
- Stormwater issue on slope from driveway & parking area
- Group camp property

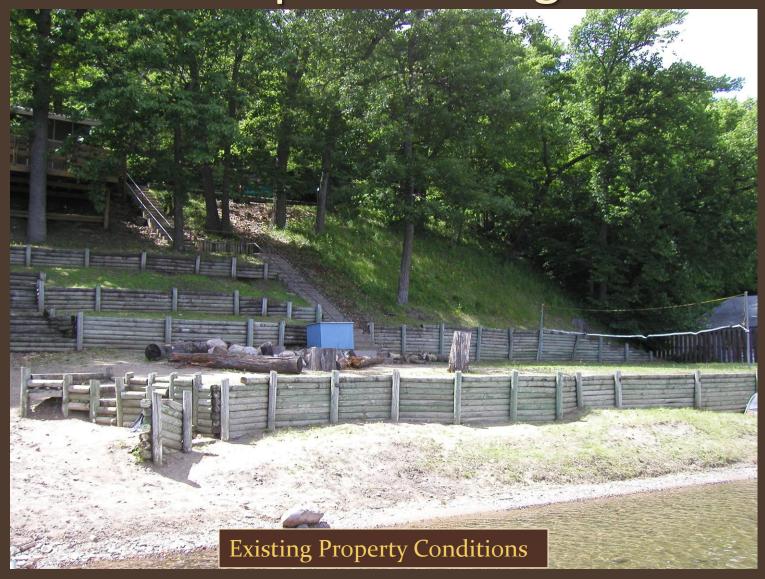






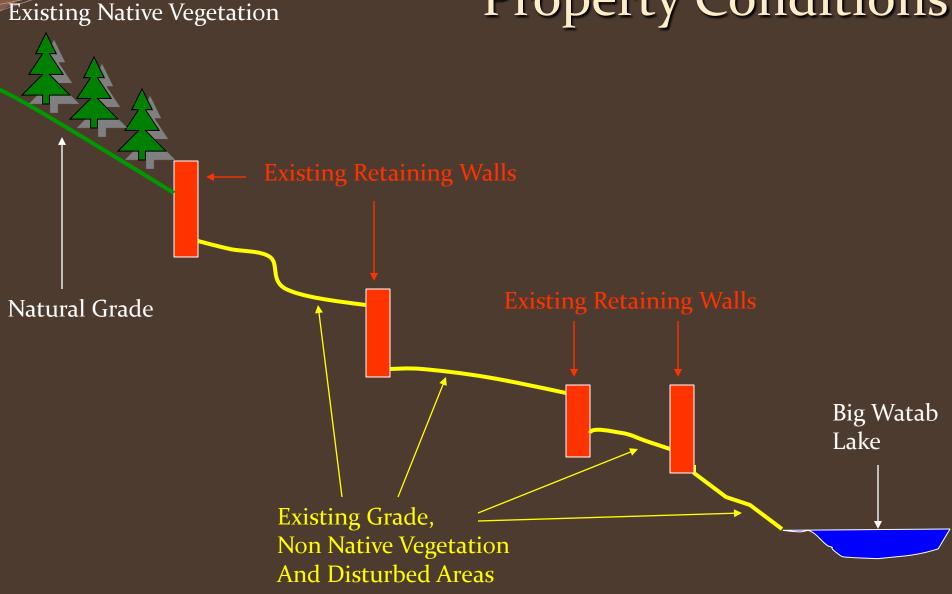


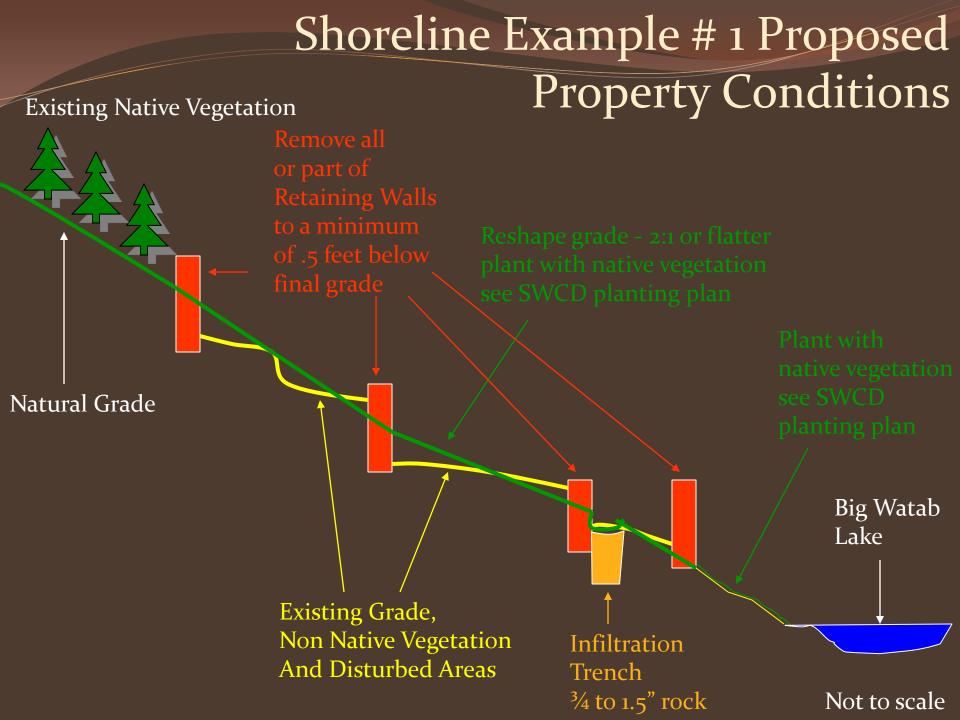




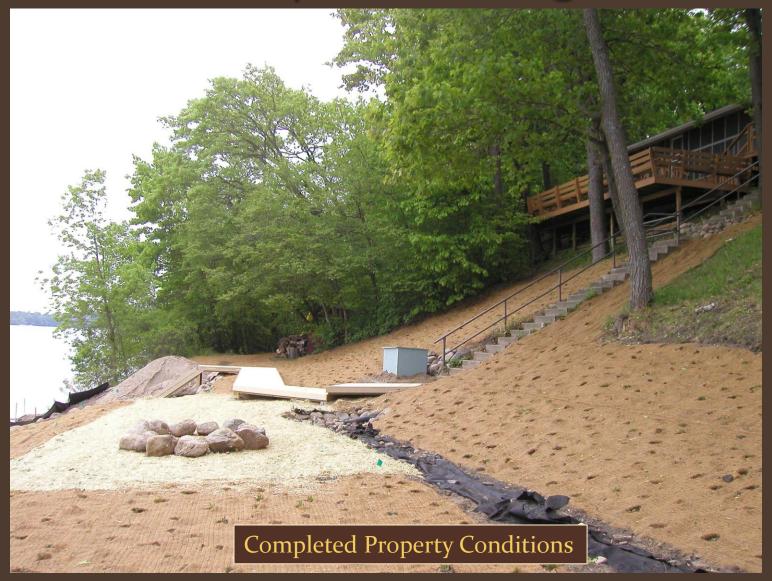
Shoreline Example # 1 - Existing Property Conditions

Not to scale





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Project Facts: 140 feet of shoreline restored \$23,000 project

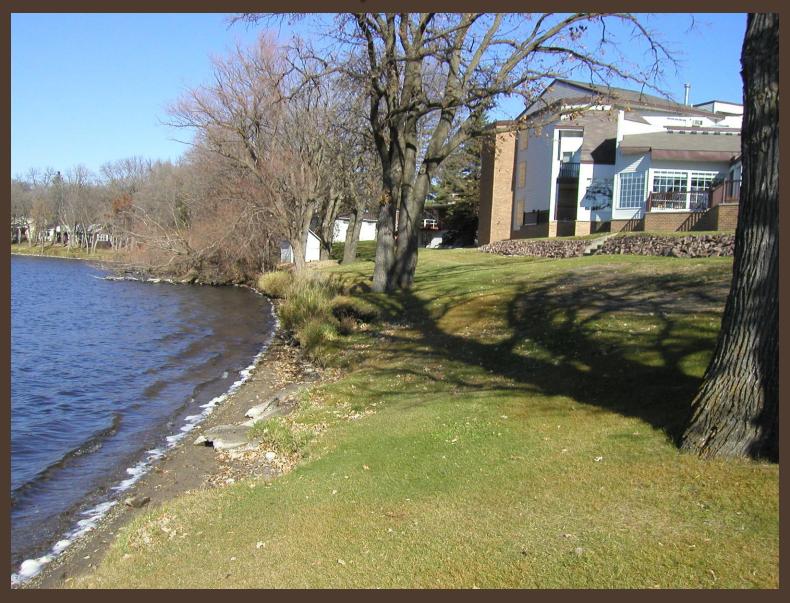
86 Cubic Yards of compacted fill on slopes 1 Stormceptor STC450I Inlet 300 Lineal Feet of timber retaining walls removed 800 Square Yards of Coconut erosion blanket 2626 Native Grass and Wildflower Plugs 27 Native Trees and Shrubs

Background & Design Considerations:

- Approximately 1.5 miles of fetch to the site
- Reservoir basin with extreme water fluctuation (5.5 feet)
- Large watershed with extreme water fluctuation
- Erosion problem with mowed lawn grass to the waters edge
- Hospital desired minimal access with native plant restoration and erosion control













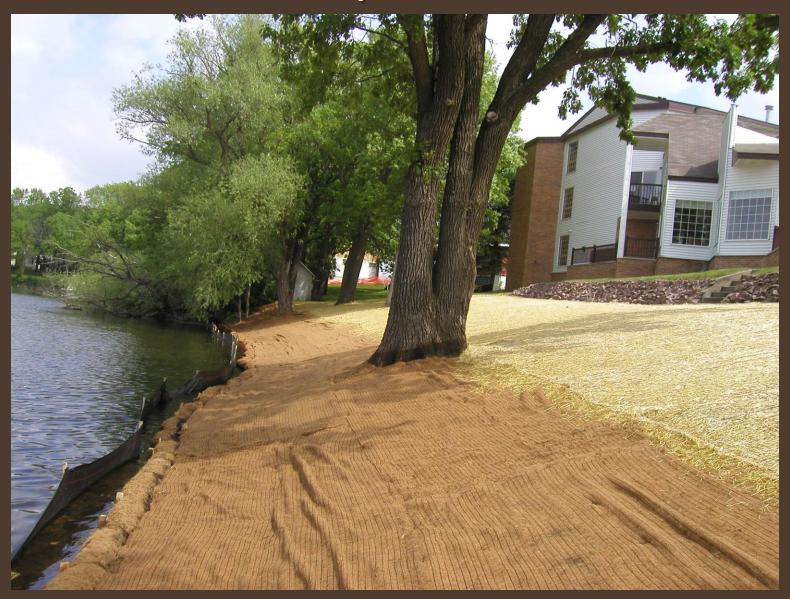






























Project Example # 2 – Sauk Lake

Project Facts: 470 feet restored \$26,300 project with planting as a workshop

290 Cubic Yards of excavation 470 Lineal Feet of Coir Log 235 Willow Live Stakes 60 Trees and Shrubs 50 Vines 16 lbs. Native Grass and Wildflower Seed 6960 Native Grass and Wildflower Plugs Planted Aquatic plants with "bricks"

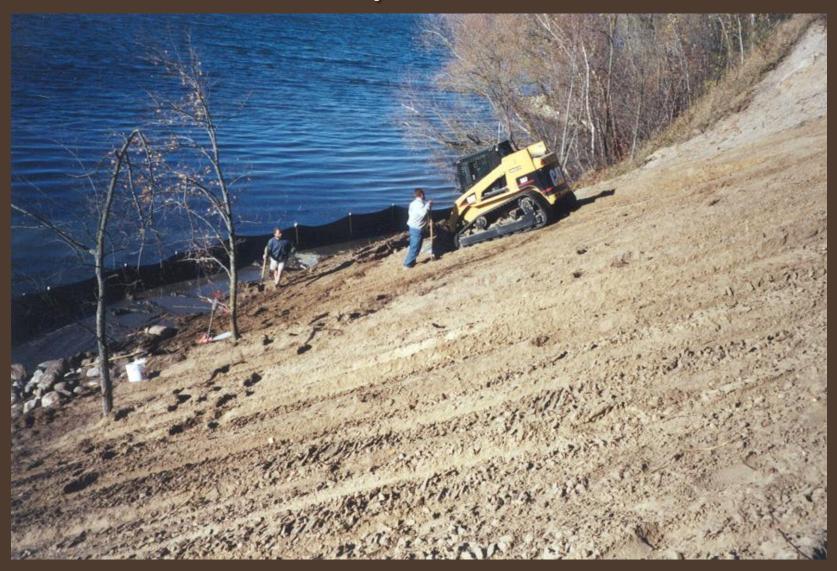
Background & Design Considerations:

- Approximately 2 miles of fetch to the site
- Reservoir basin with extreme water fluctuation (5.5 feet)
- Large watershed with extreme water fluctuation
- Extreme erosion problem with no lot development or alteration
- Landowner desired minimal access with native plant restoration
- Used as many natural techniques as possible within the site characteristics





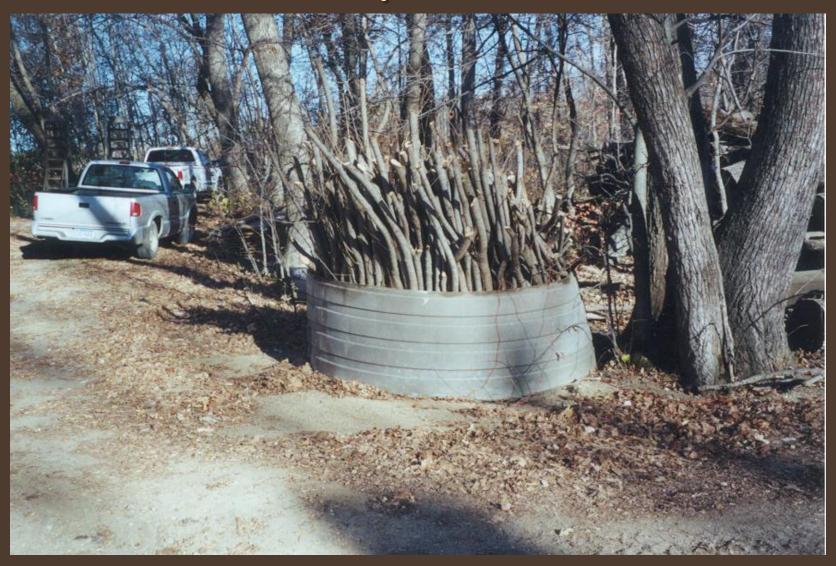










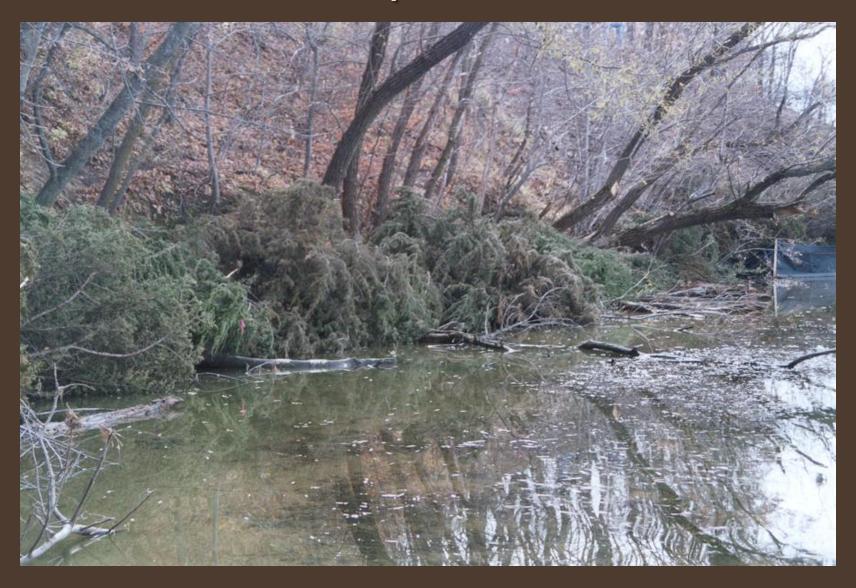


















































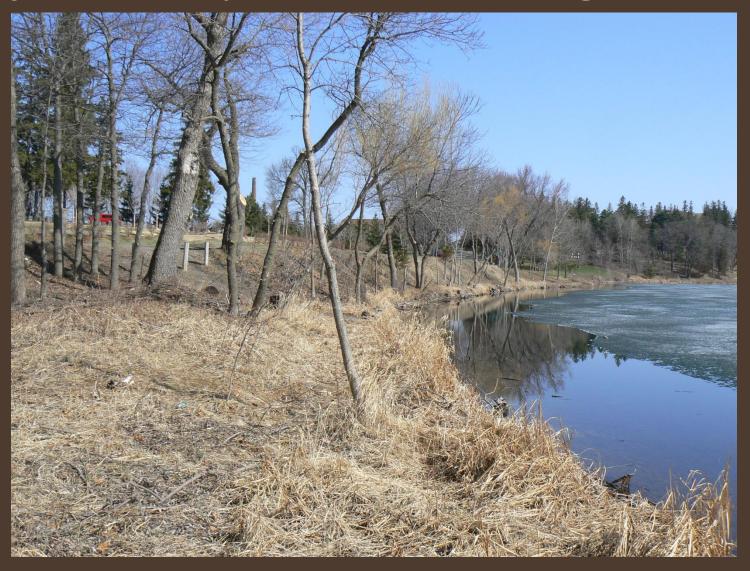


Project Facts: 500 feet of shoreline restored \$35,000 project

1,100 Cubic Yards of excavation 30 Cedar Tree Revetments 500 Willow Live Stakes 400 Lineal Feet of Willow Fascines 265+ Trees, Shrubs, Vines 31.5 Tons of Soil Loss a year reduced

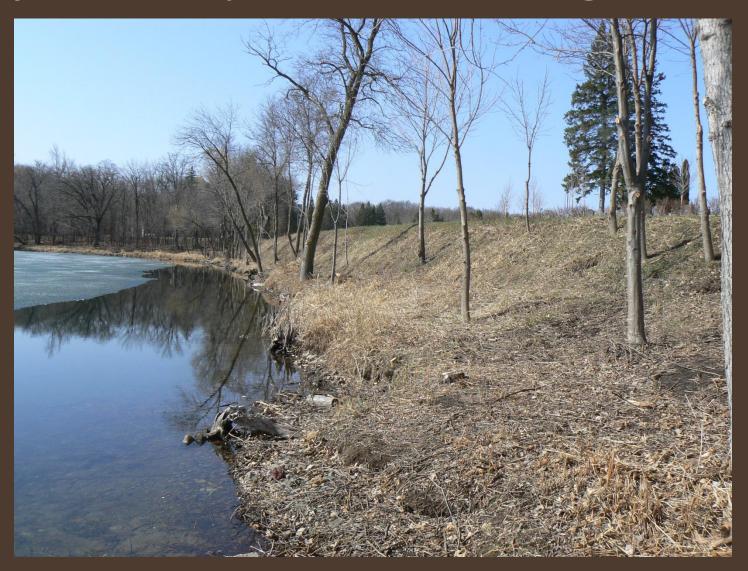
Background & Design Considerations:

- Existing erosion on shoreline
- Natural lake basin with very little water fluctuation
- Small watershed with majority in forest cover
- Landowner desired natural shoreline protection
- County Road adjacent to the shoreline

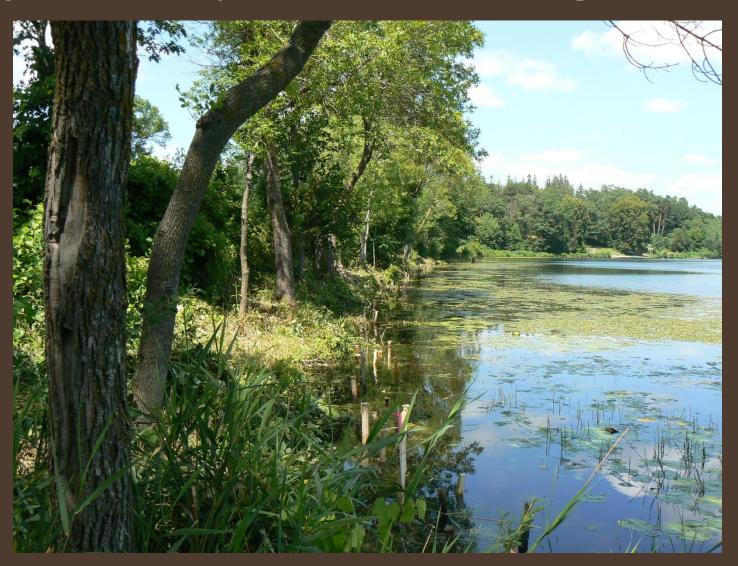






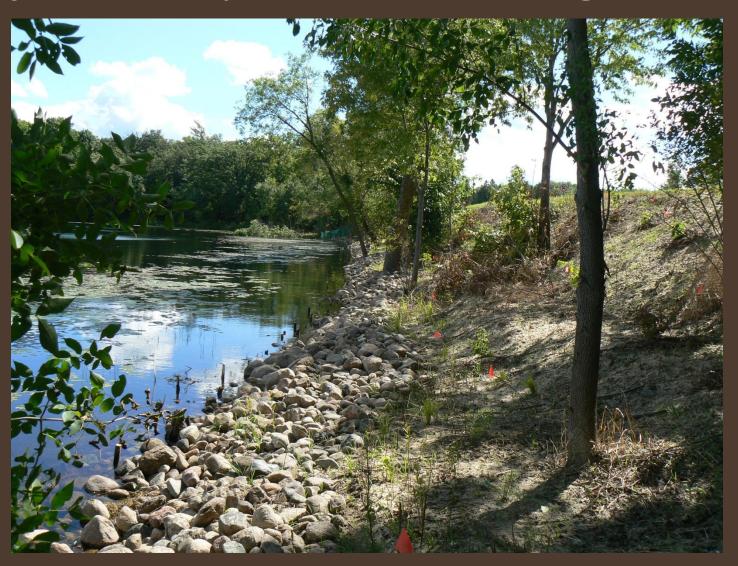














Project Facts: 560 feet restored \$26,300 project

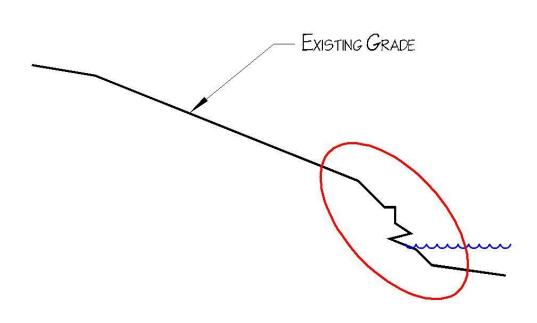
- 173 Cu. Yds. Of Field Stone Rock Riprap placed by hand
- 360 Lineal Feet of brush bundles
- 2,500 Sq. Yds. of Flexterra Hydromulch in place of erosion control blanket
- 87 Trees and Shrubs
- 36 Vines
- 15 lbs. Native Grass and Wildflower Seed
- 350 Native Grass and Wildflower Plugs

Background & Design Considerations:

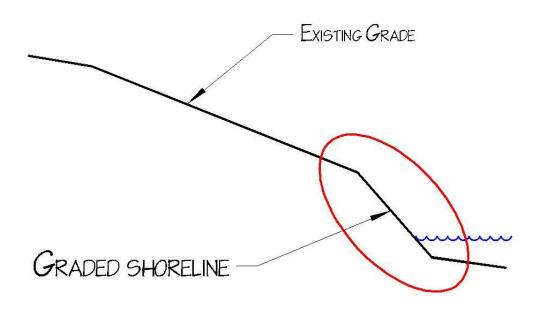
- Existing erosion on shoreline
- Reservoir basin with extreme water fluctuation (6 feet)
- Large watershed with extreme water fluctuation
- Landowner desired natural shoreline protection
- Green Armor demonstration site

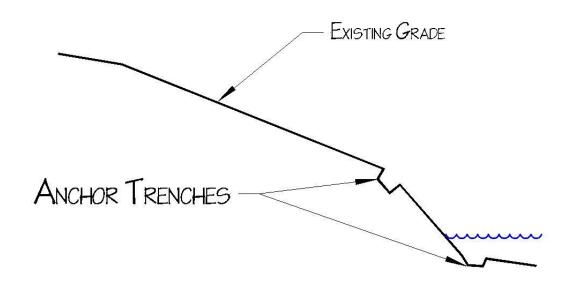


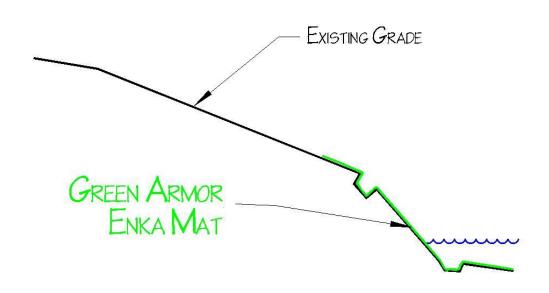








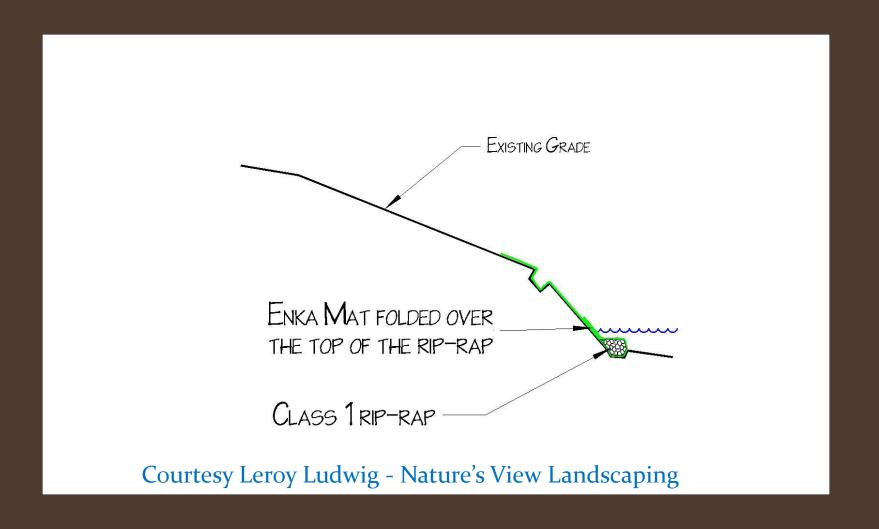






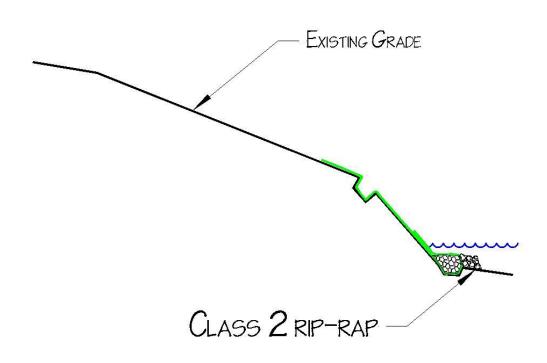


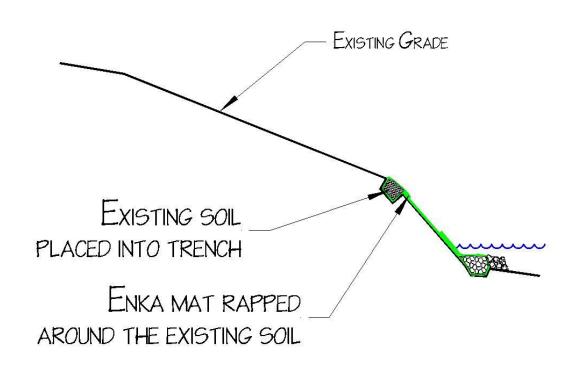




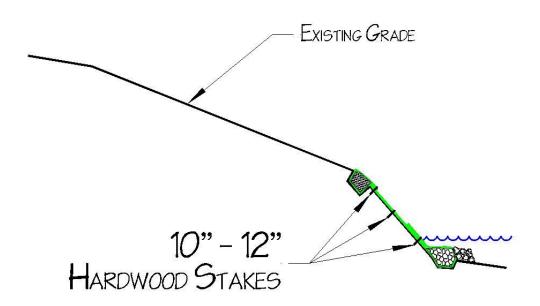




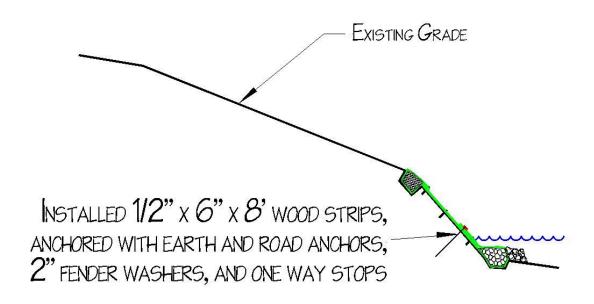




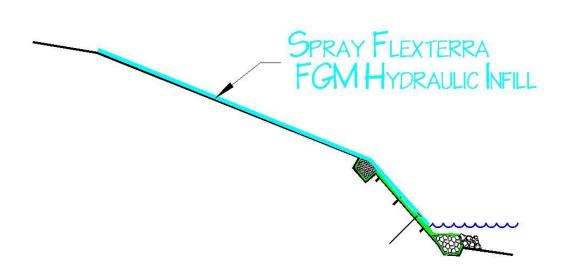




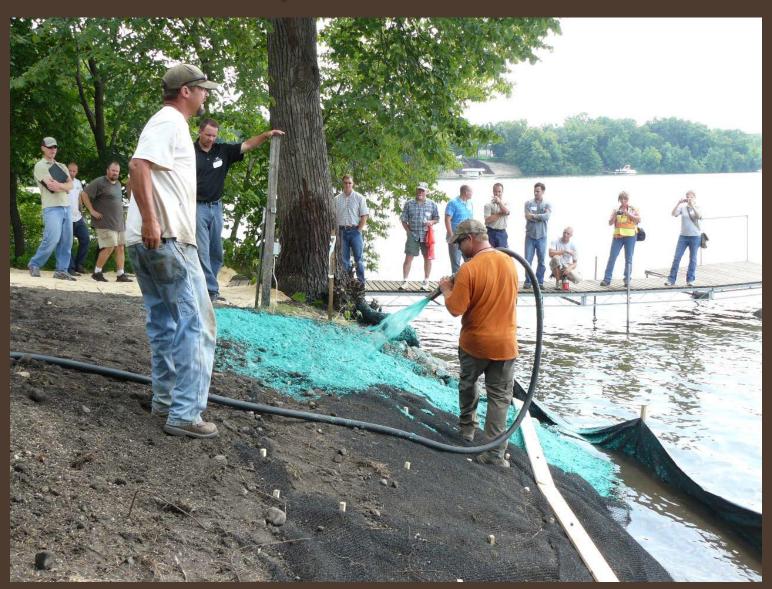








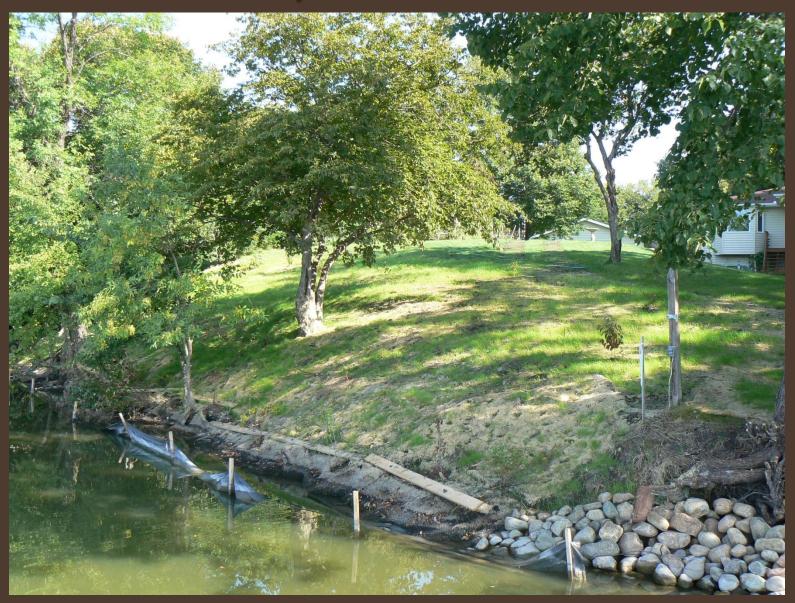


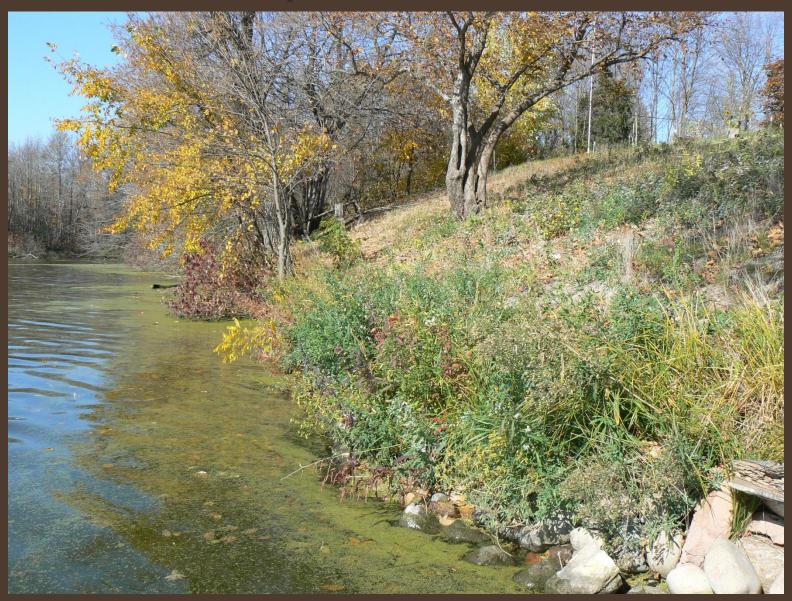


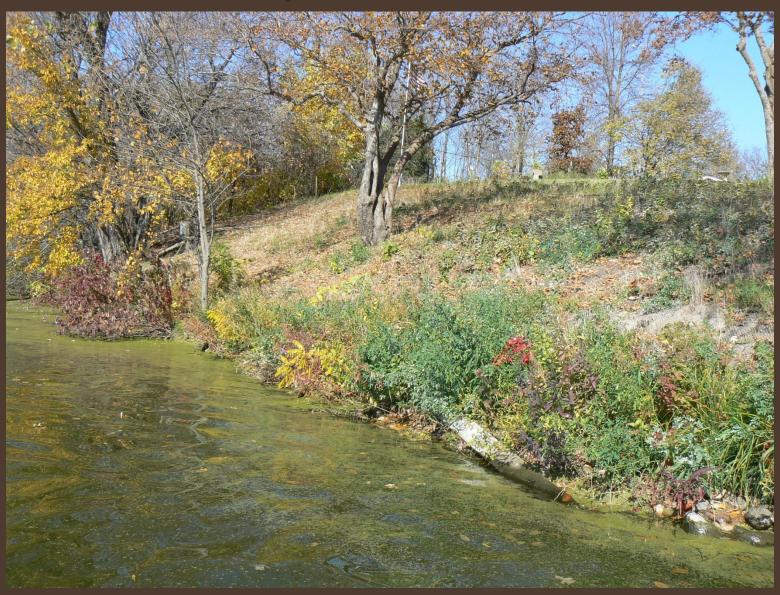


Courtesy Leroy Ludwig - Nature's View Landscaping









Shoreline Example # 5 – Horseshoe Lake Project Timeline

- July 20th Spray Rodeo
- July 29th Spray Rodeo
- Aug 10th Trim/Grub, Rip-rap by dock, prep shore (half day)
- Aug 11th Enka Mat & Rip Rap (day)
- Aug 12th Finish shoreline, prep/till/rake (1/2 day)
- Aug 13th Finish transition zone, spray (Workshop day 2 ½ hrs)
- Aug 17th Planting (half day)

Rock Rip Rap (Class 1)	4 cu yd
Rock Rip Rap (Class 2)	21 cu yd
Filter Fabric (MNDOT Type 3, Non-Woven)	64 sq yd
Topsoil Borrow (MNDOT 3877)	14 cu yd
Green Armor 7020 Enka Mat	150 sq yd
½" x 8' x 6" Wood Strips	11 each
Earth Anchors (w/ Poly Bands & One Way Stop)	22 each
2" Diameter Fender Washers	22 each
10" -12" Hardwood Stakes (375 ea)	per vendor
Flexterra FGM Hydraulic Infill – 2800 SF	per vendor

Cover Crop – Annual Rye	10 lbs.
Native Grass Seed – Transition Zone	o.5 lbs.
Native Grass Plugs – Transition Zone	215 ea.
Wildflower Seed – Transition Zone	o.5 lbs.
Wildflower Plugs – Transition Zone	215 ea.
Trees/Shrubs – Transition Zone (1 to 2 gal)	9 ea.
Vines – Transition Zone	9 ea.
Native Grass Seed – Upland Zone	1.0 lbs.
Native Grass Plugs – Upland Zone	280 ea.
Wildflower Seed – Upland Zone	o.5 lbs.
Wildflower Plugs – Upland Zone	280 ea.
Trees/ Shrubs – Upland Zone (1 to 2 gal)	10 ea.

Background & Design Considerations:

- Approximately 1.5 miles of fetch to the site
- Reservoir basin with extreme water fluctuation (5.5 feet)
- Large watershed with extreme water fluctuation
- Mowed lawn grass to the waters edge -> Goose Problem!
- Two landowners (brothers) worked together on adjacent properties



















Project Example # 6 – Sauk Lake

Project Facts: 600 feet restored \$12,600 project

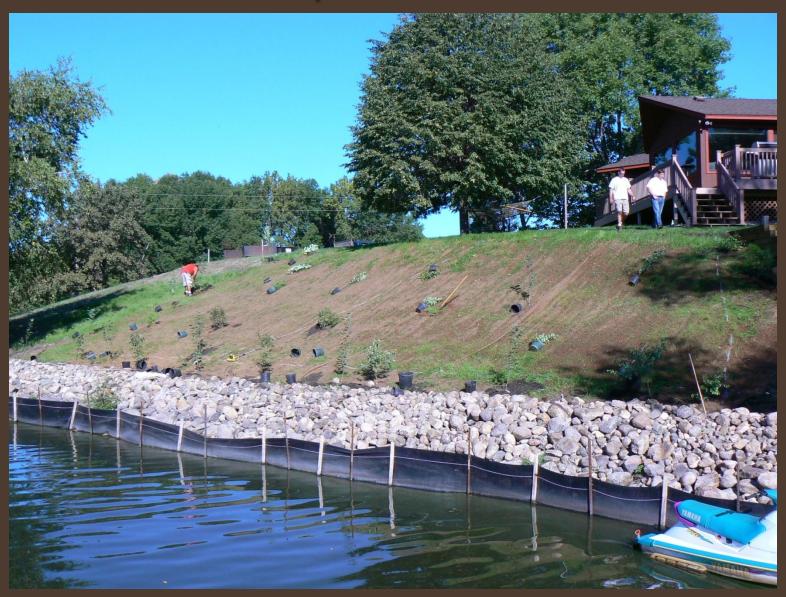
30 Cubic Yards of topsoil 600 Lineal Feet of Coir Log 500 Sq. Yds. of Coconut Erosion Control Blanket 20 Trees and Shrubs 50 Vines 7.5 lbs. Native Grass and Wildflower Seed 2,560 Native Grass and Wildflower Plugs

Background & Design Considerations:

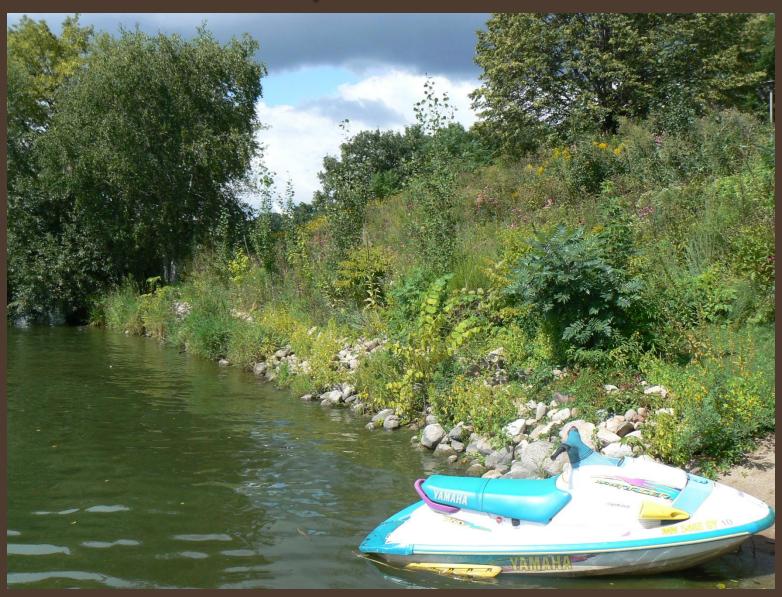
- Existing field stone rock riprap on shoreline
- Reservoir basin with extreme water fluctuation (6 feet)
- Large watershed with extreme water fluctuation
- Failing retaining wall
- Landowner restored 2 lots, one with cabin and one vacant

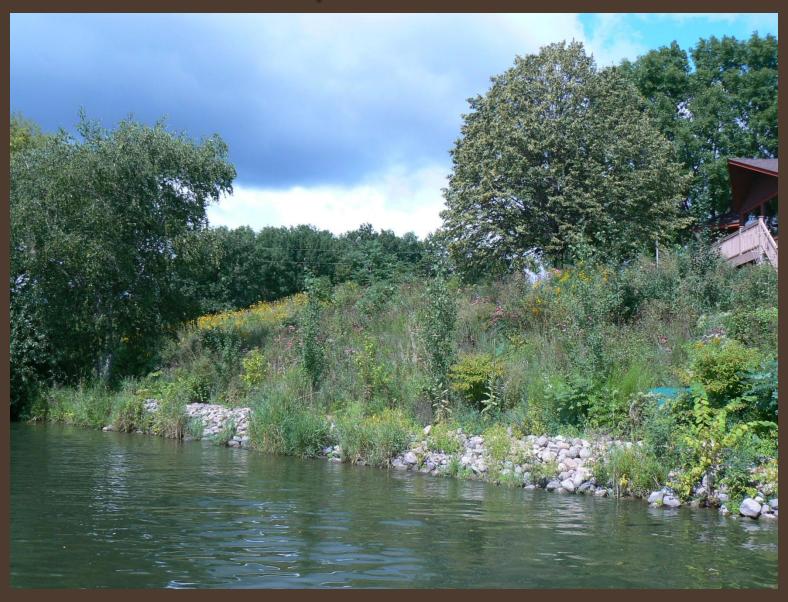












Project Facts: 300 feet restored 3/4 acre restored \$23,600 project

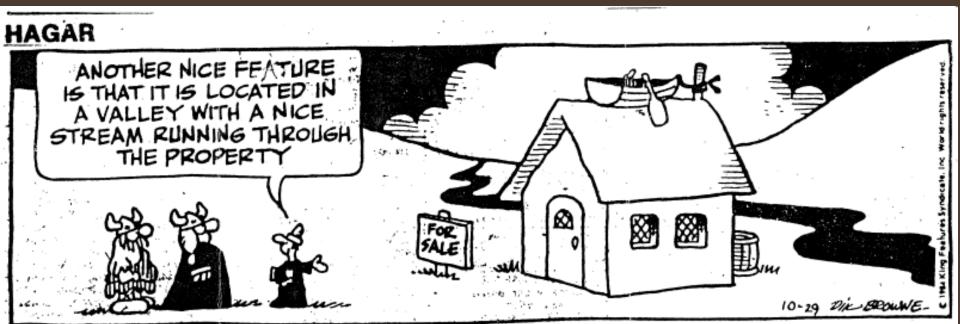
15 lbs. of Native Grass and Wildflower seed 2,700 Native Grass and Wildflower plugs 49 Trees and Shrubs 11 Vines

Shoreline Alternatives -



"It was blocking my view."

Areas Suitable For Shoreline Restorations



Areas Suitable For Shoreline Restorations



Shoreline Stabilization Projects



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